IAT1_Scheme and Solution- SAN

Internal Assessment Test 1 – March 2024

Sub:	Storage Area Network(SAN)					Sub Code:	18CS822	Branch:	ISE
Date:	16/3/2024	Duration:	90 mins	Max Marks:	50	Sem/Sec:	C	OBE	

Answer any FIVE FULL Questions

		MARKS	CO	RBT
1	Explain with diagram difference between ***a) Server-Centric Storage Architecture—*** ***5 Marks***	[10]	L1	CO 1

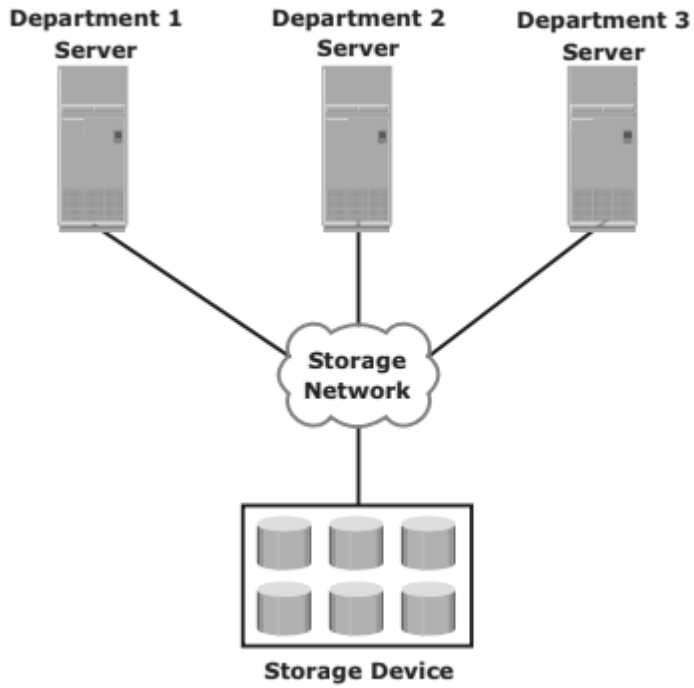
(a) Server-Centric Storage Architecture

Server-centric storage architecture

- Business units/departments to have their **own servers and storage.**
- each server has a l**imited number of storage devices,**
- any **administrative tasks**, such as maintenance of the server or increasing
- Storage capacity might result in unavailability of information.
- resulted in **unprotected, unmanaged,**

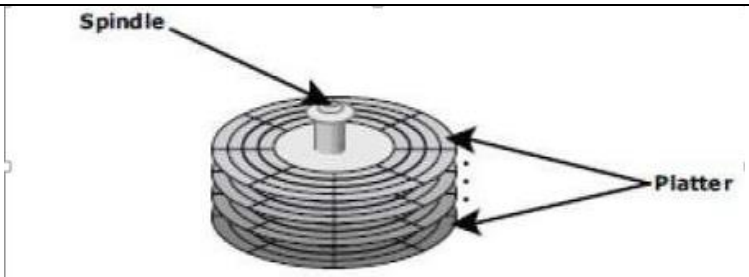
Fragmented **islands** of information and increased capital and operating expenses.

(b) Information-Centric Storage Architecture with neat diagram. ***5 Marks***



(b) Information-Centric Storage Architecture

	Storage devices are managed • Centrally and independent of servers. • Storage devices are shared with multiple servers. • The capacity of shared storage can be increased dynamically without impacting information availability. Information management is easier and cost-effective.			
2 (a)	Explain the various factors of Disk Drive Performance. **4Marks** Disk Drive Performance A disk drive is an electromechanical device that governs the overall performance of the storage system environment. 1. **Disk Service Time** Disk service time is the time taken by a disk to complete an I/O request. seek time, rotational latency, and data transfer rate. 2. **Seek Time** seek time (also called access time) describes the time taken to position the R/W heads across the platter with a radial movement (moving along the radius of the platter). Full Stroke: The time taken by the R/W head to move across the entire width of the disk, from the innermost track to the outermost track. Average: The average time taken by the R/W head to move from one random track to another, normally listed as the time for one-third of a full stroke. Track-to-Track: The time taken by the R/W head to move between adjacent tracks. 3. **Rotational Latency** To access data, the actuator arm moves the R/W head over the platter to a particular track while the platter spins to position the requested sector under the R/W head. 4. **Data Transfer Rate** data transfer rate (also called transfer rate) refers to the average amount of data per unit time that the drive can deliver to the HBA. It is important to first understand the process of read and write operations in order to calculate data transfer rates.	[04]	L 2	CO 1
(b)	Draw a neat diagram of Disk Drive and explain its components. **6Marks** A disk drive uses a rapidly moving arm to read and write data across a flat platter coated with magneticparticles. • Data is transferred from the magnetic platter through the R/W head to the computer. • Several platters are assembled together with the R/W head and controller, most commonly referredto as a hard disk drive (HDD). • Data can be recorded and erased on a magnetic disk any number of times. • This section details the different components of the disk, the mechanism for organizing and storingdata on disks, and the factors that affect disk performance. • Key components of a disk drive are platter, spindle, read/write head, actuator arm assembly, andcontroller. **1. Platter**	[06]	L 2	CO 1

	 Figure: Spindle and platter **2.Spindle** A spindle connects all the platters, as shown in above figure and is connected to a motor. The motor of the spindle rotates with a constant speed. **3.Read/Write Head** Read/Write (R/W) heads, shown in Figure, read and write data from or to a platter. Drives have two R/W head, one for each surface of the platter **4. Actuator Arm Assembly** actuator arm assembly which positions the R/W head at the location on the platter where the data needs to be written or read. **5. Controller** controller is a printed circuit board, mounted at the bottom of a disk drive. **6. Physical Disk Structure :** Data on the disk is recorded on tracks, which are concentric rings on the platter around the spindle			
3	Explain Data center infrastructure including Core elements and Key requirements. **Data Center Infrastructure** ➢ Organizations maintain data centers to provide centralized data processing capabilities across the enterprise. ➢ The data center infrastructure includes computers, storage systems, network devices, dedicated power backups, and environmental controls (such as air conditioning and fire suppression). Five core elements are essential for the basic functionality of a data center: **1. Application** **2. Database** **3. Host/Computer** **4. Network** **5. Storage Array** **Core Elements 5 Marks** **Key Requirements 5 Marks**	[05+05]	L 1	CO 1

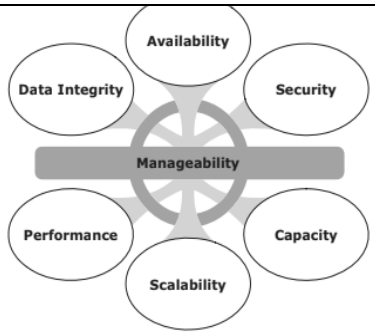


Figure 1-6: Key characteristics of a data center

4a	Write the list of all RAID levels for configuring a storage array. 4Marks **RAID Levels** • Application performance, data availability requirements, and cost determine the RAID level selection. • These RAID levels are defined on the basis of striping, mirroring, and parity techniques. • Some RAID levels use a single technique, whereas others use a combination of techniques. Table given below shows the commonly used RAID levels.	[05]	L 1	CO 1
4b	Explain any three RAID levels with suitable diagrams. ***RAID 0, RAID 1*** with neat diagrams **6Marks**	[06]		

LEVELS	BRIEF DESCRIPTION
RAID 0	Striped set with no fault tolerance
RAID 1	Disk mirroring
Nested	Combinations of RAID levels. Example: RAID 1 + RAID 0
RAID 3	Striped set with parallel access and a dedicated parity disk
RAID 4	Striped set with independent disk access and a dedicated parity disk
RAID 5	Striped set with independent disk access and distributed parity
RAID 6	Striped set with independent disk access and dual distributed parity

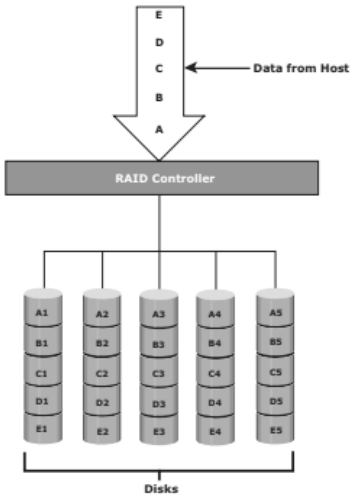


Figure 3-5: RAID 0

- **RAID 0** configuration uses **data striping techniques**
- where data is striped across all the disks within a RAID set.
- It utilizes the full storage capacity of a RAID set.
- RAID 0 is a good option for applications that need **high I/O throughput.**
- if these applications require high availability during drive failures, **RAID 0 does not provide data protection and availability.**

RAID1

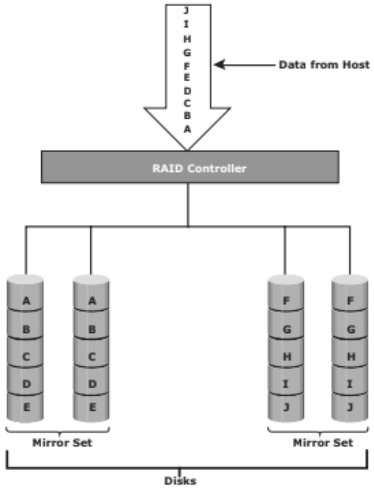
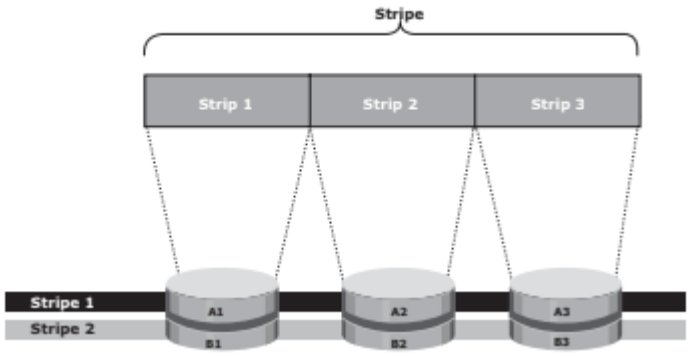
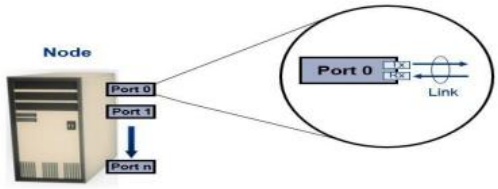
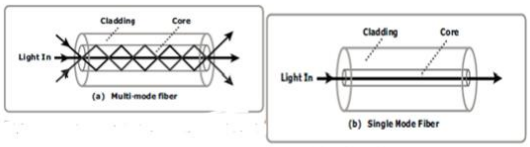
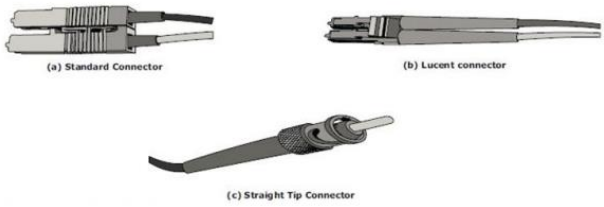


Figure 3-6: RAID 1

- **RAID 1 is based** on the **mirroring technique.**
- Provides fault tolerance.
- **On failure data recovery is fast.**
- RAID 1 is suitable for applications that require **high availability and cost is no constraint.**

5a	***Identify the type of RAID technique*** used in the below shown diagram. 2Marks  **Identification -2 marks-Stripping**	[2]	L 3	Co 1
5b	List and explain the advantages and disadvantages of the above RAID Technique. **Advantages- 2 marks** • Striping is a technique to **spread data across multiple drives** (more than one) to use the drives in **parallel.** • All the read-write heads work simultaneously, allowing more data to be processed in a shorter time and increasing performance, compared to reading and writing from a single disk. • addressable disk blocks are defined as a strip.Within each disk in a RAID set, a predefined number of contiguously **Disadvantages – 2 Marks** **No fault tolerance**	[4]		

5c	What is the need for using a ***RAID Controller*** in a ***RAID Array***? 4Marks • Management and control of disk aggregations. • Translation of I/O requests between logical disks and physical disks Data regeneration in the event of disk failures.	[4]		
6	Draw a neat diagram of Fibre Channel SAN and explain its components. Components of FC SAN infrastructure are: 1) Node Ports, 2) Cabling, 3) Connectors, 4) Interconnecting Devices (Such As Fc Switches Or Hubs), 5) San Management Software.  **Fig 2.1: Nodes, Ports, links**  **Fig 2.2: Multimode fiber and single-mode fiber**  	[10]	L2	CO 1

HOD **CCI** **CI**